

WHAT IS CLAIMED IS:

1. A glass-melting furnace (10) comprising:
an upstream end (6), a downstream end (8), and a roof (22), the upstream end being positioned upstream of the downstream end;
a charger (32) to supply glass-forming material (30) to the upstream end of the furnace;
at least one burner (34) to supply heat to the glass-forming material at the upstream end of the furnace; and
an exhaust (60) in communication with the downstream end of the furnace, the exhaust being positioned downstream of the at least one burner.
2. The glass-melting furnace (10) of claim 1 in which the at least one burner (34) is mounted through the roof (22) of the furnace.
3. The glass-melting furnace (10) of claim 1 in which the at least one burner (34) is a plurality of burners.
4. The glass-melting furnace (10) of claim 3 in which more than 50 percent of the burners (34) are positioned upstream of the exhaust (60).
5. The glass-melting furnace (10) of claim 4 in which all of the burners (34) are positioned upstream of the exhaust (60).
6. The glass-melting furnace (10) of claim 1 in which the exhaust (60) is an exhaust stack.
7. The glass-melting furnace (10) of claim 1 in which the exhaust (60) is a plurality of exhaust stacks.
8. The glass-melting furnace (10) of claim 1 in which the exhaust (60) is disposed at a discharge end wall (16) of the furnace.
9. The glass-melting furnace (10) of claim 1 in which the exhaust (60) is disposed at a sidewall (18a, 18b) of the furnace.
10. The glass-melting furnace (110) of claim 1 in which the at least one burner (34) is a plurality of burners mounted through the roof (22) of the furnace, all of the burners are positioned upstream of the exhaust outlets (60a, 60b), and the exhaust comprises at least two exhaust outlets.
11. The glass-melting furnace (110) of claim 10 in which the exhaust outlets (60a, 60b) are a plurality of exhaust stacks.

12. A glass-melting furnace (10) comprising:
 - an upstream end (6) having a charge end wall (14) and a downstream end (8) having a discharge end wall (16), the upstream end being positioned upstream of the downstream end;
 - an exhaust (60) in communication with the furnace, the exhaust having a centerline (72) that is positioned at least about 70 percent of the distance from the charge end wall of the furnace to the discharge end wall of the furnace.
13. The glass-melting furnace (10) of claim 11 in which the exhaust centerline (72) is positioned at least about 80 percent of the distance from the charge end wall (14) of the furnace to the discharge end wall (16) of the furnace.
14. The glass-melting furnace (10) of claim 12 wherein the furnace comprises two sidewalls (18a, 18b) and two exhausts (60a, 60b), each exhaust being separated laterally from the sidewalls.
15. In a glass-melting furnace (10) having an upstream end (6) with a charge end wall (14) and a downstream end with a discharge end wall (16), the upstream end being positioned upstream of the downstream end, the improvement comprising: an exhaust (60) in communication with the furnace at the downstream end of the furnace.
16. The glass-melting furnace (10) of claim 15 wherein the exhaust (60) is disposed at the discharge end wall (16).
17. The glass-melting furnace (10) of claim 15 wherein the exhaust (60) comprises an exhaust stack.
18. The glass-melting furnace (10) of claim 15 wherein the exhaust (60) comprises a plurality of exhaust stacks.
19. A method of operating a glass-melting furnace (10) having an upstream end (6) and a downstream end (8), the method comprising the steps of:
 - introducing glass-forming material (30) to the upstream end of the furnace;
 - heating the glass-forming material with at least one burner (34), the at least one burner being located at the upstream end of the furnace; and
 - exhausting gases of combustion in the furnace from an exhaust (60) positioned at the downstream end of the furnace.
20. The method of claim 19 in which the furnace (10) has a discharge end wall (16) positioned at the downstream end (8) of the furnace, and a charge end wall (14)

positioned at the upstream end (6) of the furnace, and further including the step of positioning a centerline (72) of the exhaust (60) at least about 70 percent of the distance from the charge end wall of the furnace to the discharge end wall of the furnace.

21. A method of operating a glass-melting furnace (10, 110, 210) having a charge half (80) and a discharge half (84) comprising:

introducing glass-forming material (30) to the charge half of the furnace;

heating the glass-forming material with a plurality of burners (34), the burners providing energy and forming gases of combustion, the majority of the energy from the burners being introduced to the furnace in the charge half of the furnace; and

exhausting the gases of combustion from an exhaust (60) connected to the discharge half of the furnace.

22. The method of claim 21 in which a centerline (72) of the exhaust (60) is positioned at least about 70 percent of the distance from a charge end wall (14) of the furnace (10) to a discharge end wall (16) of the furnace.

23. The method of claim 21 in which a centerline (72) of the exhaust (60) is positioned at least about 80 percent of the distance from a charge end wall (14) of the furnace (10) to a discharge end wall (16) of the furnace.

24. The method of claim 21 in which the step of exhausting includes providing a flow of combustion gases within the furnace (10) in a direction from the charge half (80) of the furnace to the discharge half (84) of the furnace.

25. The method of claim 21 in which the energy from the burners (34) introduced into the charge half (80) of the furnace (10) is at least twice the energy from the burners introduced to the discharge half (84) of the furnace.

26. A method of exhausting gases of combustion from a glass-melting furnace (10), the method comprising the steps of :

introducing glass-forming material (30) into an upstream end (6) of a glass-melting furnace;

establishing a pressure differential between the upstream end of the furnace and a downstream end (8) of the furnace, the pressure at the downstream end of the furnace being lower than the pressure at the upstream end of the furnace;

exhausting combustion fumes and gases from an exhaust (60) in communication with the downstream end of the furnace, the pressure at the exhaust being lower than the pressure at the downstream end of the furnace; and

discharging molten glass from the downstream end of the furnace.